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TECHNICAL PROGRESS REPORT ON
INDIVIDUAL AIR CONDITIONING FOR FARROWING SOWS 1/

By

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Cooled, dry, breathing air was supplied to farrowing sows to reduce heat stresses in a cooperative experiment conducted by John G. Taylor and Ernest A. Johnson, U. S. Department of Agriculture, Agricultural Engineering Research Division, and Tillman Bubenzer and Don H. Fisher, Conner Prairie Farms at Noblesville, Indiana.

These preliminary tests conducted in the summer of 1957 indicated that refrigerated air, supplied in small quantities directly to the sow, may be as effective as air conditioning the entire farrowing structure.

Hogs normally lose heat by conduction to the surface on which they are lying, by convection to the surrounding air, and by evaporation of moisture from their lungs. Hogs do not sweat, but at 80° F. about 40 percent of the total heat losses of the animals comes from evaporation, and at 100° F. about 90 percent of the total heat losses comes from evaporation. 3/ This evaporation of moisture occurs within the lungs of the animals 3/.

1/ This material reports results of cooperative research between the Agricultural Engineering Department, Purdue University Agricultural Experiment Station, and the Agricultural Engineering Research Division, Agricultural Research Service, USDA.

2/ Located at the Agricultural Engineering Department, Purdue University, Lafayette, Indiana.

The author wishes to thank Mr. John J. Slazas, Student Trainee, for his assistance in conducting these tests.

3/ Bond, T. E., C. F. Kelly, and Hubert Heitman, Jr. Heat and Moisture Loss from Swine. Agricultural Engineering 33(3): 148, 152, 154. March 1952.

Mechanically cooled, dry air supplied to the sow for breathing purposes at the rate of 8 cubic feet per minute appears to relieve the heat stresses of sows confined in farrowing crates by aiding them to lose heat more readily by respiration. Less than 1/10 of a ton of refrigeration per sow is theoretically required to condition this amount of air, when outside temperatures are at 100° F. and 45 percent relative humidity. The air is cooled down to 40° F. at the refrigerator to remove moisture and then delivered by ducts directly to the front of each farrowing crate. The air may reheat 10° to 30° F. in the ducts but no moisture will be regained.

Additional cooling effects from the refrigerated air are obtained by the envelope of cooled air around the sow when she is enclosed in an area as small as a farrowing crate provided the crate has solid walls. This is similar in principle to open-top freezers used in markets for displaying frozen foods.

In this system of cooling, no room air is recirculated. Outside air, after being cooled and dried, is continuously supplied to the sows. Additional outside air may be forced into the house by fans for ventilation or the house may be ventilated by providing large openings for natural air movement. The only insulation requirements are good reflective surfaces on the building exterior to reduce heat gain from solar radiation.

In the initial tests made on the Conner Prairie Farms a 5-ton heat pump which previously had been used to air-condition a 26- by 50-foot farrowing room for 15 sows was modified slightly for these experiments. The air-delivery system previously used for refrigerated air was converted into a ventilating system forcing fresh outside air into the building at all times.

An 8- by 8-inch insulated duct was installed completely around the farrowing area at ceiling level. This was a recirculating system which conducted air over the refrigerator coils. An inlet was provided to introduce small quantities of outside air to replace the air delivered through each 4-inch drop pipe to the individual sows. Different types of delivery nozzles were tried. The simplest was an elbow with a 4-inch opening. This elbow was cut so that it directed the air slightly downward and across the front end of the farrowing pen. All nozzles were located in the pig-creep areas for protection from the sows.

Three to seven pens were not supplied with cooled air during various tests, the sows from these pens being used to check against the sows supplied with the cooled air. On three different days, when inside temperatures ran between 81° and 85° F. with outside temperatures of 83° to 91° F., rectal temperatures, surface temperatures, and respiration of all animals were measured at regular intervals. These tests indicated that



Cool dry air piped to farrowing pen reduces heat stresses of sow and pigs at Conner Prairie Farms, Noblesville, Indiana, during August 1957.

John G. Taylor, USDA agricultural engineer, points to thermocouple used in measuring temperature of cooled air supplied to sow and pigs.



the test sows were more comfortable than the check sows. The most noticeable differences were in the lower respiration rates of the sows supplied with the cold air.

No conclusions could be drawn from these tests, however, as the tests were not conducted for long enough periods under high enough temperatures to produce real heat stress in the sows used as check animals. However, the animals provided with cooling air appeared to be quite comfortable throughout the summer tests. The doors were left open, and outside air was supplied to the barn by the ventilating system at all times, providing clean, fresh air, with no odors. There was no sudden change in environment when the sows were taken from the barn to the exercise and feeding lot twice daily, as there would have been had the entire room been air-conditioned. Additional tests are planned.

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